Relations and Functions

MGSE8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

MGSE8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). ***For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.***

Essential Questions:

- What is a function?
- What are the characteristics of a function?
- How do you determine if a relation is a function?
- How is a function different from a relation?
- Why is it important to know which variable is the independent variable?

Some Definitions-

- A **relation** between two variables x and y is a set of ordered pairs

- An **ordered pair** consists of an x and y-coordinate
  - **A relation** may be viewed as *ordered pairs, mapping design, table, equation, or written in sentences*

- x-values are **input**, **independent variable**, **domain.**

- y-values are **output**, **dependent variable**, **range**

Example 1:
What makes this a relation?

$$\{(0,-5),(1,-4),(2,-3),(3,-2),(4,-1),(5,0)\}$$

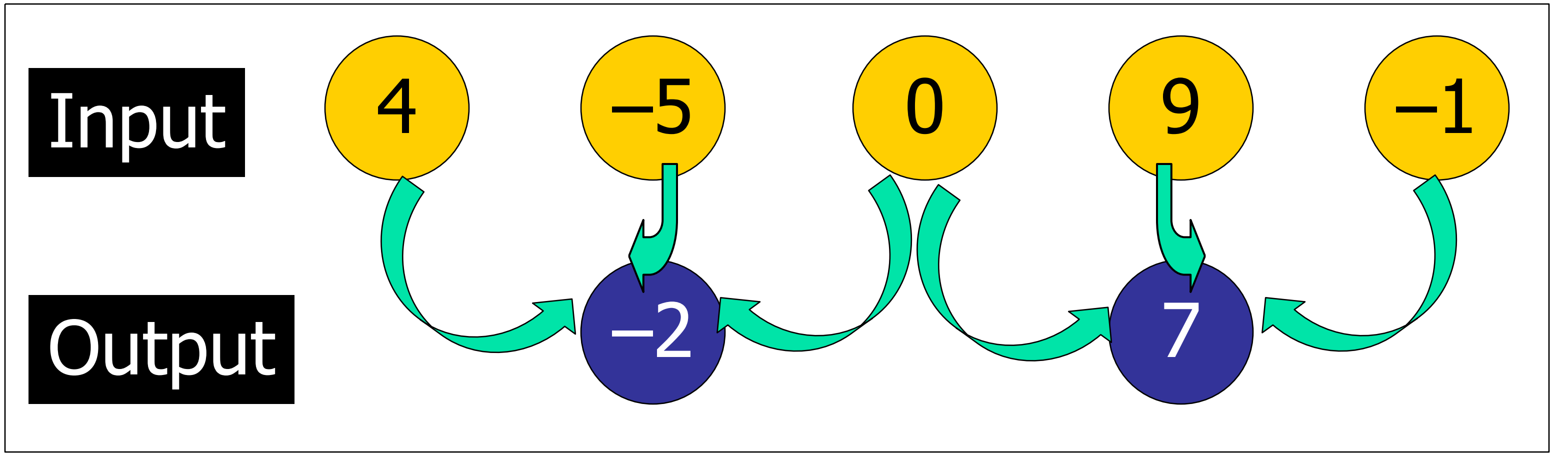
- What is the **domain**?

{0, 1, 2, 3, 4, 5}

What is the **range**?

{-5, -4, -3, -2, -1, 0}

Example 2 – Is this a relation?



- What is the **domain**?

{4, -5, 0, 9, -1}

- What is the **range**?

{-2, 7}

Is a relation a function?

What is a **function**?

According to a textbook, **"a function is...a relation in which every input has exactly one output"**

Is a relation a function?

- Focus on the **x-coordinates**, when given a relation

If the set of ordered pairs has **different** **x-coordinates**,

it **IS** **A** function

If the set of ordered pairs has **same** **x-coordinates**,

it is **NOT** a function

- **Y-coordinates** have no bearing in determining functions

Example 3

$$\{(0,-5),(1,-4),(2,-3),(3,-2),(4,-1),(5,0)\}$$

- *Is this a relation?*

YES

- *Is this a function?*
  - ***Hint:*** *Look only at the* ***x-coordinates***

YES

Example 4

$$\{(\ \ 1,-7),(1,0),(2,-3),(0,-8),(0,5),(\ \ 2,-1)\}$$

- ***Is this a function?***
  - ***Hint:*** *Look only at the* ***x-coordinates***

NO

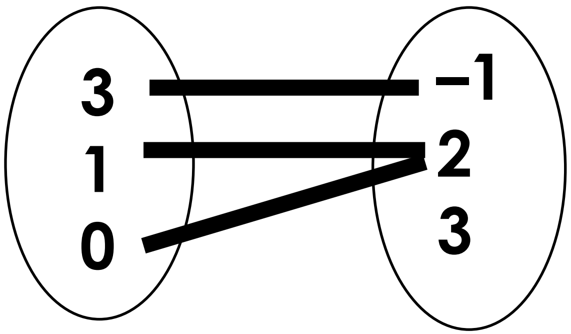
- ***Is this still a relation?***

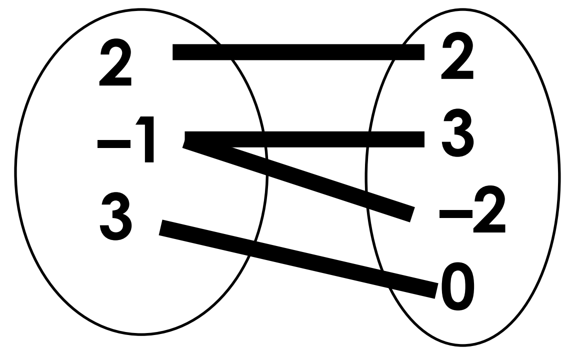
YES

Example 5

Which relation mapping represents a function?

Choice One Choice Two



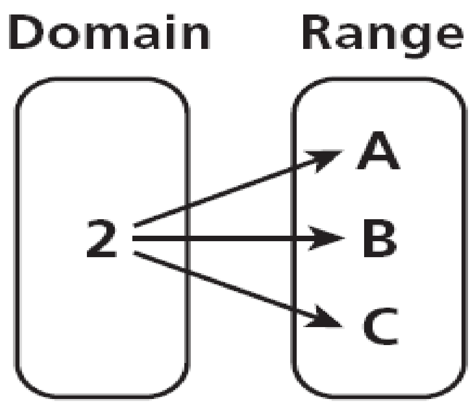


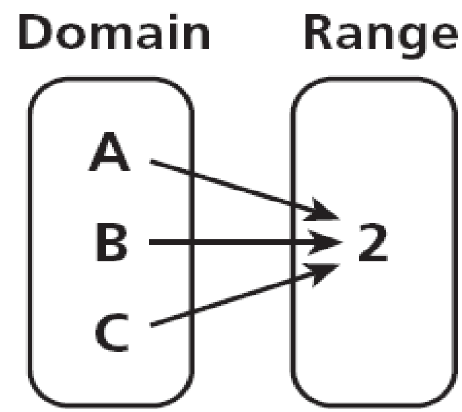
Choice 1

Example 6

Which relation mapping represents a function?

A.B





B

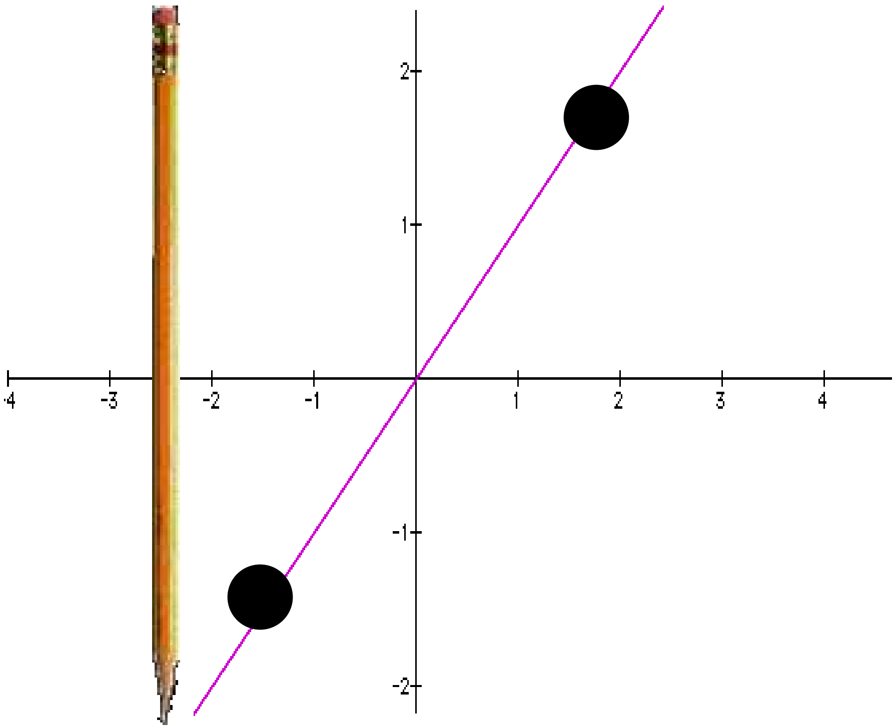
Vertical Line Test

- **Vertical Line Test:** *a relation is a function if a vertical line drawn through its graph, passes through only one point.*

*AKA: **"The Pencil Test"***

*Take a pencil and move it from **left to right (–x to x)**; if it crosses more than one point, it is not a function*

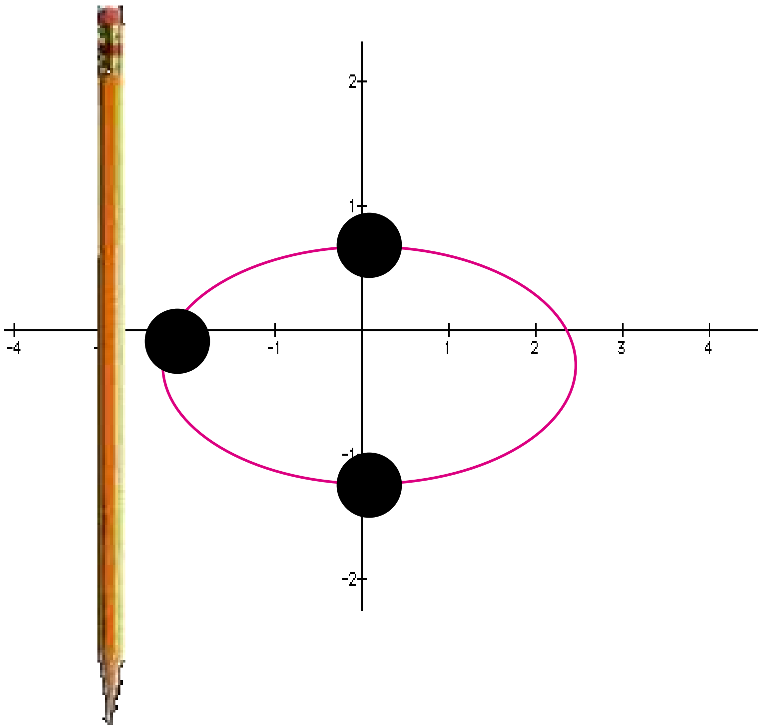
Vertical Line Test



Would this graph be a function?

YES

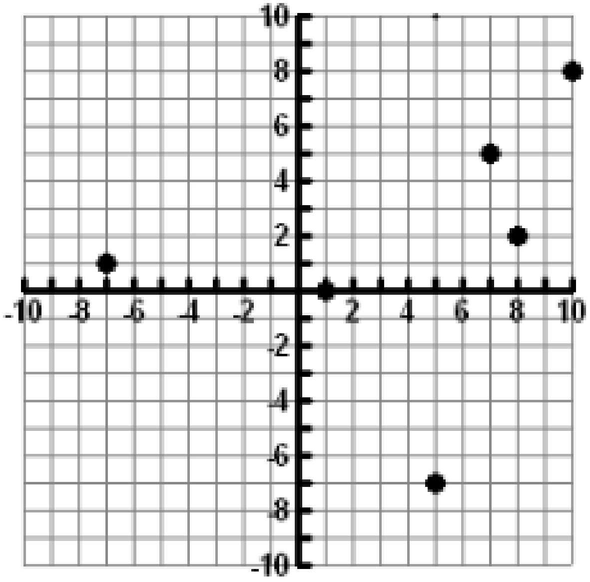
Vertical Line Test



Would this graph be a function?

NO

Is the following function discrete or continuous? What is the Domain? What is the Range?

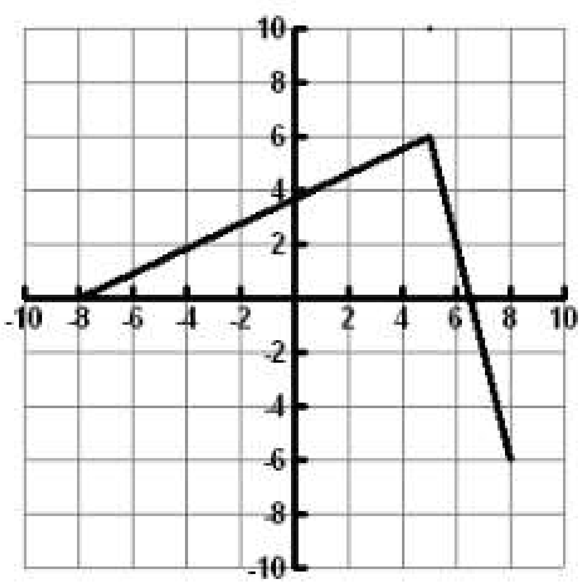


Type: Discrete

Domain: {-7, 1, 5, 7, 8, 10}

Range: {1, 0, -7, 5, 2, 8}

Is the following function discrete or continuous?
What is the Domain? What is the

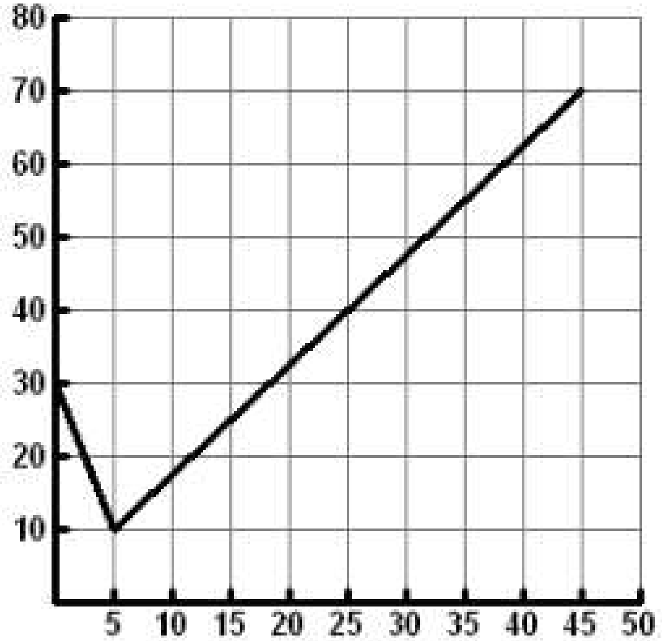


Type: continuous

Domain: $[-8,8]$

Range: $[-6,6]$

Is the following function discrete or continuous? What is the Domain? What is the Range?

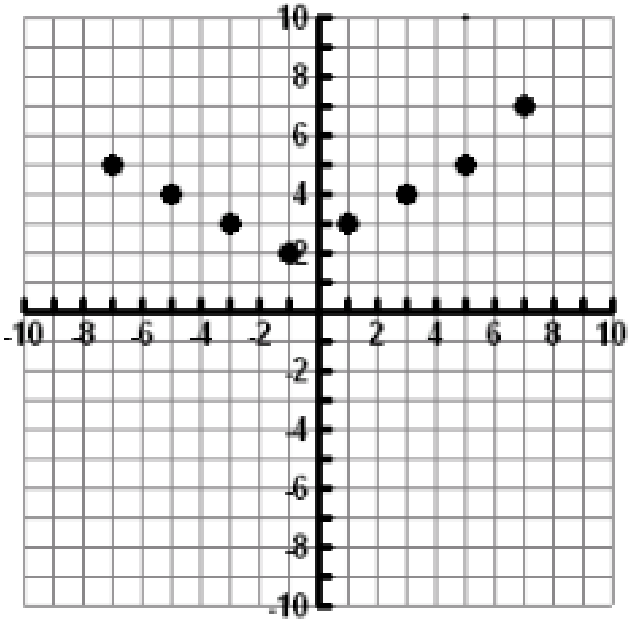


Type: continuous

Domain: $[0,45]$

Range: $[10,70]$

Is the following function discrete or continuous? What is the Domain? What is the Range?



Type: discrete

Domain: {-7, -5, -3, -1, 1, 3, 5, 7}

Range: {2, 3, 4, 5, 7}

Example 7

Which situation represents a function?

a. The items in a store to their prices on a certain date

b. Types of fruits to their colors

There is only one price for each different item on a certain date. The relation from items to price makes it a function.

A fruit, such as an apple, from the domain would be associated with more than one color, such as red and green. The relation from types of fruits to their colors is not a function.

Domain and Range in Real Life

The number of shoes in x **pairs** of shoes can be expressed by the equation $y = 2x$.

What is the independent variable?

The **# of pairs** of shoes.

What is the dependent variable?

The **total #** of shoes.

Domain and Range in Real Life

Mr. Landry is driving to his hometown. It takes four hours to get there. The distance he travels at any time, *t*, is represented by the function d = 55t (his average speed is 55mph.

What is the independent variable?

The time that he drives.

What is the dependent variable?

The total distance traveled.

Domain and Range in Real Life

Johnny bought at most 10 tickets to a concert for him and his friends. The cost of each ticket was $12.50. Complete the table below to list the possible domain and range.

1	2	3	4	5	6	7	8	9	10
12.50	25.00	37.50	50	62.50	75	87.50	100	112.50	125

What is the independent variable?

The number of tickets bought.

What is the dependent variable?

The total cost of the tickets.

Domain and Range in Real Life

Pete's Pizza Parlor charges $5 for a large pizza with no toppings. They charge an additional $1.50 for each of their 5 specialty toppings (tax is included in the price).

What is the independent variable?

The number of toppings

What is the dependent variable?

The cost of the pizza